University of Alberta

Are there Significant Differences in Academic Achievement Between Homeschooled and Conventionally Schooled Students?

by

Maria A. C. Watkins ©

A thesis submitted to the Faculty of Graduate Studies and Research in partial fulfillment of the requirements for the degree of Master of Education in Counselling Psychology

Department of Educational Psychology

Edmonton, Alberta

Fall 1997

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Degree: Master of Education

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled ARE THERE SIGNIFICANT DIFFERENCES IN ACADEMIC ACHIEVEMENT BETWEEN HOMESCHOOLED AND CONVENTIONALLY SCHOOLED CHILDREN submitted by MARIA A. WATKINS in partial fulfillment of the requirements for the degree of Master of Education in Counselling Psychology.

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Abstract

The homeschool movement is one of the fastest growing segments of education in North America. Because of this growth, parents, public school officials, judiciary, and legislators are faced with the problem of responding to homeschooling. Presently there is very little systematic research upon which to make informed decisions regarding homeschooling. This study attempted to add to that small base of research by answering the research question, "Are there significant differences in academic achievement between homeschooled and coventionally schooled children?" An ex post facto research design was used to investigate the research question. The Alberta Provincial Achievement Testing Program results for 212 grade 3 and 186 grade 6 homeschooled students were compared with five random samples (equivalent in size for grade 3 and grade 6) of conventionally schooled students. The means of the language arts scores were statistically analyzed for significant differences between these homeschooled and conventionally schooled samples. Results indicated that both grade 3 and grade 6 homeschooled students scored significantly higher than the conventionally schooled students in reading, $p<.05$. The writing results showed that there were no significant differences between the two groups, $p>.05$. It was concluded that the homeschooled children who took part in this study are not suffering academically from their homeschool experience. Much more research needs to be done so that parents and educational leaders might make informed decisions

concerning the option of homeschooling.

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CHAPTER ONE

INTRODUCTION

The Problem

In these post modern times of cyberspace and virtual reality, the recent growth of families choosing to educate their children at home may seem quite unusual if not anachronistic. However, "within the last two decades educating children within the home-in lieu of sending them to public school has become an increasingly acceptable form of education" (Smith, 1996, p.9). Although home education was the primary form of education in Colonial America, it virtually disappeared with the formation of compulsory education laws in the 1890's (Buchannon, 1987; Pitman,1987; Whitehead & Bird, 1984; Carrere, 1983; cited in Stough, 1992). The recent resurgence of parents choosing to homeschool, in direct opposition to governmental statutes, makes this practice problematic for educators, legislators, and even judicial officials. There is much concern and controversy about the efficacy of homeschooling. Educators are especially skeptical about the capacity of the homeschooling environment to provide an adequate education for children (Common & MacMullen, 1985; Lines, 1995; & Owen, 1986).

There are a number of concerns that the recent resurgence of homeschooling has brought to the forefront of educational research. The majority of professional

educators and the general public question the ability of the homeschooling environment to meet the social, emotional, and intellectual needs of children (Lines, 1994). This study will narrow the focus of the homeschooling controversy to academic performance. In particular, it will endeavor to investigate whether homeschooled children are achieving academically comparably to those educated in conventional schools.

In the introduction to the problem the current renaissance of the homeschooling movement and some of the ramifications of this movement upon educational, governmental, and judiciary organizations are briefly presented. The remainder of the introduction will present the historical backgound to the advent of the homeschooling movement, the purpose of the study, the significance of the study, the research methodology, the hypotheses, and definitions of terms.

Background To The Problem

To better examine the practice of homeschooling and ways in which to evaluate its success it is important to understand the evolution of this movement. Since the inception of compulsory education laws in 1890, there has always been a marginalized sector of society that believed that mass education could never accomplish the unfoldment of knowledge within the individual. This rebellion against the mass agenda of formal schools is briefly outlined in the

following summary of the historical background of homeschooling.

The transcendentalists were early rebels of the 1890's who fought against the educational tenets of the industrial age (Aiex, 1994). In opposition to the transcendentalists, educators of that time did not believe that children would learn under their own volition or that the lower classes would want their children to be educated. In fact, it was thought that education should be forced in order to ensure that poor immigrant families were assimilated into the White Protestant American culture. Also, it was used to stop these poor families from engaging in the practice of child labor brought on by poverty (Lines, 1986b cited in Tipton, 1990). Consequently, education was made compulsory and the curriculum was externally directly by trained and licensed people.

> "before the industrial revolution, people had scheduled their lives in harmony with the seasons, holidays, and their own preferences. But, factories required a shift from agricultural time to the much more precise categories of industrial time, with its sharply delineated and periodized work day. Schools taught [factory behavior], not only through textbook preachments, but also through the very character of their organization--their grouping, periodizing, and

objective impersonality were not unlike those of the factory"(cited in Llewllyn, 1991, p.46). In short, the educational system was being used to mold the child to fit the hierarchic rungs of the society rather than to facilitate and nurture intellectual freedom.

The scholarly writings of Dewey and Parker in the 1890's, like the beliefs of the transcendentalists, were opposed to the industrial goals of mass education (Aiex, 1994). They wrote about purposeful activity rather than passive reading, memorizing, and reciting. By 1919 Montessori and Waldorf designed curriculums to nurture the interests and developmental needs of the child (Aiex, 1994).

Alternative education did not flourish until the revolutionary times of the 1960's. Educational critics such as Paul Goodman, A.S. Neil, John Holt, Jonathan Kozol, Herbert Kohl, James Herndon, and George Dennison began to openly criticize the educational and moral premise of schools (Aiex, 1994). These educators believed that schools needed reform. They felt that conventional schools stifled the aspirations, creativity and individual uniqueness of its recipients. Furthermore, they believed that the brutal competition within schools contradicted ideals of community and cooperation. Consequently, free schools and cooperatives were created, which ultimately contributed to the rise of the modern homeschooling movement (Aiex, 1994; Lines, 1994).

The development of the contemporary homeschooling movement was presented in this segment of the introduction. The literature suggests that in the early stages of this movement educators and families pursued this alternative approach to education because of their commitment to the pedagogical belief that all learning should be child-led (Aiex, 1994; Lines, 1994; McGraw et al., 1993).

Purpose of the Study

The purpose of this study is to obtain and analyze data to determine if there is a significant difference in academic achievement between homeschooled and conventionally schooled children.

Significance of the Study

There are a number of reasons why comparison of academic achievement between homeschooled and public schooled children is useful. First, assessing the quality of academic experience is essential in order to ascertain whether it is valuable and useful. Much testing and evaluation has already been done on the adequacy of the education public school children receive. It is now time to evaluate the quality of the education of homeschooled children to determine whether its educational quality is comparable to that provided in public schools.

Second, there is much skepticism about the capacity of the homeschool to meet the educational needs of children (Common & Macmullen, 1985; Owen, 1986; Aiex, 1994; Lines,

1995; & Nelson, 1986). Educators claim that homeschooled children are academically and socially deprived (Common & MacMullen, 1985; Owen, 1986; Aiex, 1994; Lines, 1995; & Nelson, 1986). Some superintendents have even sued parents of homeschooled children for truancy. In one such case, a judge in West Virginia (who found for the state) claimed that to weaken compulsory education laws would mean that

> "parents have the right to keep their children in medieval ignorance, quarter them in Dickensian squalor beyond the reach of the ameliorating influence of the social welfare agencies, and to separate their children from organized society in an environment of indoctrination and deprivation that the children become mindless automatons incapable of coping with life outside their own families" (Zirkel & Glukman, 1983 cited in Frost, 1988).

The criticisms of the homeschooling movement need to be examined empirically. Research on achievement will determine whether homeschooled children are being academically deprived. Discussions of homeschooling can then be based on scientific analysis and not just opinion.

Third, doing an evaluation now is important given the current growth of homeschooling. Homeschooling has had a recent rebirth on the North American continent. It is no longer a novel or quaint concept. Since the 1970's the

numbers of homeschooled children have expanded fifteen and sixteen fold in Canada and the United States respectively. Homeschooling is now one of the fastest growing segments of American education (Frost & Morris, 1988). Its current popularity and its radical departure from traditional education makes this topic worthy of scientific examination.

American studies estimate that the number of home schooled children increased from 15,000 in 1970 to over 250,000 in 1988 (Lines cited in Stough, 1992; Ray, 1986; & Calvery, 1992). Others estimate still higher numbers (Calvery, 1992; Lines, 1994; Ray, 1986; & Stough, 1992).

In Canada the data on the prevalence of homeschooled children is scant. Eight years ago home schooling associations estimated the national totals to be about 2,000. Smith (1996) claims that excluding Quebec, 9,400 home schoolers are officially registered with a board of education. Unofficially, numbers obtained from home schooling sources in Ontario and Alberta suggest that the national totals are closer to 30,000. The Edmonton Journal of September 23, 1996 estimated that there are 7,058 homeschooling families in Alberta, which represents about one per cent of the total school population of Alberta (Finlayson, 1996).

The increasing prominence of homeschooling is surprising, considering the risk, work, and responsibility of such a task. "These parents are prepared to risk

potential truancy charges, societal suspicion and a huge investment of their time and money to take on the job" of educating their children (Common & MacMullen, 1985). Such parental determination and the explosive increase in the numbers of home educated students deserve critical examination.

The fourth reason for doing research in this field is that the current work is inadequate. First, the outcomes studies done on homeschooling are few in number. Fewer than twenty outcome studies have been completed. Second, the majority of the work is dated. Eighty-five percent of the literature on home schooling was published in the eighties (Wright, 1989; Ray, 1986). Third, much of the work that exists on homeschooling is descriptive and qualitative rather than inferential. There is a growing body of descriptive statistical evidence, survey work, and case study evidence on homeschooling. While such research is valuable, it is insufficient for the following reasons. It does not allow the researcher to study samples and then make general statements about a population. Nor does descriptive and qualitative research allow the researcher to determine whether significant differences exist between groups. Outcome research, which uses inferential statistical techniques, produces data that are more easily interpreted. Conducting an outcome study on homeschooling would be a step towards making the work in this field more thorough.

Fifth, the significance of this type of study lies in its ability to increase scientific knowledge. Each study builds evidence that can be integrated into a theoretical framework. Theory development is the ultimate goal of science. It answers the "whys" regarding homeschooling by integrating, organizing, and categorizing isolated data collected on this topic. As soon as a theory statement can be made about the relationship between homeschooling and academic achievement, educators should be able to explain why certain results occur and predict the conditions under which these results will occur again. If outcome research on academic achievement consistently demonstrates that homeschooled children perform significantly better than conventionally schooled children in academic subjects then researchers can then start to theorize why homeschooling students perform better. One theory could be that homeschools provide optimal conditions for educating children. Consequently, children who are educated under conditions similar to homeschooling environments will enhance their academic achievement.

In addition to theory building, the accumulation of empirical data will also help parents, educators, judges, and legislators make informed decisions regarding the future of homeschooling (Ray, 1989). For educators, in particular, homeschool teaching practices could be adopted by schools if the research demonstrated that homeschools were found to be

more effective. Such empirical evidence would suggest the hypotheses that smaller student-teacher ratios, more independent study time, increased student input regarding what should be learned, meaningful parent involvement in classrooms and tutorial methods of teaching are valuable.

This work could also be used to foster a co-operative partnership between home and school. One possible development from this type of investigation could be homeschooled children and their parents being invited into the school system. Homeschooled children could be asked to use school classrooms, equipment and human resources as part of their learning experiences. With the aid of new research, which in turn can lead to more tolerant actions on the behalf of school boards, "home educators and traditional educators can work together to create the optimal academic education for the homeschooled child" (Frost, 1988, p. 112). Brian Ray (1989) appropriately quotes John Holt in his discussion on what professionals can learn from the study of parents and children at home. John Holt writes that homeschooling is "a laboratory for intensive and long-range study of children's learning and of the way in which friendly and concerned adults can help them learn."

Research Methodology

An ex post facto research design was used to investigate if there is a possible difference in academic achievement between homeschooled and public schooled children. Outcome

studies on homeschooling typically use an ex post facto design because it is not possible to randomly assign subjects to a homeschool or a public school. The independent variable of schooling is not one that the researcher can control. The homeschooled children of this study include those who voluntarily chose to write the Alberta Education Provincial Achievement Testing Program in language arts for grades three and six in 1996. The comparison group of conventionally schooled children consists of those who wrote the Alberta Education Provincial Achievement Testing Program in language arts for grades three and six in 1996 which all conventionally schooled children are required to write. The dependent variable is the Alberta Education Provincial Achievement Testing Program scores in English language arts for grades three and six.

Hypotheses

The following null hypotheses will be tested in this study to answer the research question.

1. There are no significant differences between the reading means of homeschooled and traditionally schooled children in grades three and grade six.

2. There are no significant differences between the writing composition means of homeschooled and traditionally schooled children in grades three and six.

Definitions

Home Schooling: A learning/teaching situation wherein children spend the majority of the conventional school day in or near home in lieu of attendance at a conventional institution of education. Parents or guardians are the prime educators of their children (Ray, 1986).

Conventional Schooling: The customary learning/teaching situation wherein children spend the majority of the day in an educational institution (public or private). People other than parents or guardians are the prime educators of the children during the school day (Ray, 1986).

Summary

In the introduction the problem under investigation was described and its historical background was briefly outlined. The remainder of the introduction focused on the purpose, rationale, and methodology of the study.

CHAPTER TWO

LITERATURE REVIEW

"Proponents and critics of homeschooling have hotly debated the homeschooling issue in the popular press as well as educational publications" (Stough, 1992, p.1). Much of this debate has been based on apriori appeals to logic, philosophical arguments, anecdotal presentations, and some descriptive evidence. Prior to the 1980's, very little of the literature on homeschooling was based on empirical research (Wright, 1988; Ray, 1986; Stough, 1992; Frost & Morris, 1988; & Calvery, 1992). There are two major objectives of this chapter. The first objective is to present the debate between traditional educators and home educators. Secondly, the chapter will endeavor to examine the current evidence on the academic achievement of homeschooled children in order to help resolve one of the central concerns in the debate, which is the capacity of homeschools to meet the intellectual needs of its recipients

The Debate

Advocates of homeschooling would appear to have a heavy burden of proof in view of the case made by its opponents. The debate between traditional educators and home educators will discussed in the following order:

1. The case against homeschooling
2. The case for the advocates of homeschooling

The Case Against Homeschooling

The case against homeschooling is based on five major contentions (a) possibility of child abuse, (b) intellectual deficit, (c) social deficit, (d) economic burden, and (e) developmemt of an educational underclass.

As briefly described in the introduction, there is much mistrust between homeschoolers and traditional educators. Some educators and jurists such as the West Virginian judge mentioned in the introduction, consider homeschooling a subversive and abusive activity which should be stopped. Calgary administrator Joyce Patton calls for the need to tighten the School Act so that the well being of children is not sacrificed (cited in Owen, 1986) Franzosa (1994) points to the possibility of child abuse inherent in an isolating activity such as homeschooling. She states that the act of homeschooling may sever children from societal services which protect them from authoritarian and unjust parents.

The critics cite the intellectual and social deficit of homeschools. They argue that homeschools cannot provide quality education because they operate in an impoverished environment. They point to the lack of gyms, laboratories, music, and art programs. They question parents' qualifications and abilities to teach subjects such as physics, chemistry, mathematics, and even basic skills.

On the issue of socialization, it is widely believed that homeschooling deprives children of necessary social skills. The National Association of Elementary School Principals in the United States has maintained that education is "most effectively done through cohesive organization in formal settings". Since 1983 it has condemned homeschooling (Lines, 1995, p. 3). These educators claim homeschooled children will certainly miss out on the social skills learned from interacting with peers. They also wonder whether homeschooled children will acquire the essential skills necessary for good citizenship, further learning, and even the capacity to fit into the real world of work (Nelson, 1986). The latter concern arises because of the feeling that homeschooled children are overprotected and pampered and therefore will not be able to cope with the harsh realities of making a productive living in our highly competitive society.

There is, of course, an economic basis for concern about homeschooling. Administrators complain about the extra costs of monitoring homeschooled children. They also fear that the loss of enrollment and funds may lead to the closure of schools in rural areas if homeschooling begins to flourish (Owen, 1986). It is not surprising that superintendents have engaged parents in lawsuits in order to prevent them from leaving the school system (Owen, 1986). In fact, the majority of professional educational

organizations in the United States has taken an adversarial position on homeschooling. For example, The National Education Association has called for more rigorous regulation of homeschooling in order to curb the homeschooling movement; The National Parent-Teacher Association officially opposes the homeschooling movement (Lines, 1995). The public at large is also concerned as seen in a recent Gallup Poll in which homeschooling was rejected by a 2 - 1 margin (Gallup & Elam, 1988; cited in Stough, 1992).

Even many, who agree with homeschoolers that the school system is in need of reform, reject the decision to take children out of the system and teach them at home. This group of critics maintain that such a decision is a divisive response to a problem that calls for unified social and political action. Franzosa (1994) contends that homeschooling is selfish in that it legitimizes the educational neglect of children who remain in school, thus contributing to an educational underclass. She appeals to homeschoolers to make schools humane for all children rather than for merely a privileged few.

The Case for the Advocates of Homeschooling

The case for the advocates of homeschooling is based on six contentions (a) the decline in literacy, (b) the increase in violence, (c) the decline in quality education, (d) the inadequacy of schools to achieve excellence for the

majority of its recipients (e) the ability of homeschools to achieve excellence for the majority of children and (f) the negative social consequences of schools.

The homeschooling movement is well equipped with equally strong philosophical arguments about the benefits of homeschooling and the destructiveness of the educational system. Homeschoolers point to the glaring failures within the school system. They target the decline in literacy and the increase in violence and delinquency in schools and among schooled youth (Cizek, 1988; Moore & Moore, 1994). "The University of Texas adult studies published a report in 1983 which claimed that twenty percent of Americans have no survival literacy ability. They cannot sign a check, make out an application for a driver's license or a job or do even the most minimal of necessities of reading, writing, and figuring. Another thirty percent have doubtful survival skills and only fifty percent of Americans today have these skills for sure" (Moore & Moore, 1984 p. 236-237).

Statistics Canada reports that in 1990 sixteen percent of the Canadian population (age 16-69) lacked reading skills needed to deal with much written material they encounter in everyday life. An additional twenty-two percent of the population can carry out only simple reading tasks. Evidence collected by Statistics Canada also demonstrates that six percent of school-educated children (age 16-24) were functionally illiterate and that twenty-three percent

could carry out simple reading tasks within familiar contexts. While only fifty-six percent had the ability to complete simple math skills such as adding and subtracting with little help. According to the 1991 School Leavers Survey, one in four twenty year olds had dropped out of school.

Based on the reports from Statistics Canada, the University of Texas, and evidence gathered by Moore and Cizek (1994; 1988), a sizable number of children are not getting an adequate education via the traditional school system. Homeschoolers argue that their children would receive a higher standard of education by being homeschooled. They also feel the significant number of illerates within the school system would have a negative impact upon the quality of education that their children would receive. Furthermore, they question the caliber of education children receive in schools if schools fail to satisfactorily educate nearly one-third of their students.

Homeschoolers claim the decline in our national literacy, the high percentage of high school drop outs, and the increase of violence in schools parallels the general decline in the quality of education public school children receive. Further to this point on quality education, homeschoolers contend that public education is too content-driven. Therefore, little time and effort is left to properly develop skills in language, logic, reasoning,

debate, and problem solving. In fact, it is asserted that schools create the "dumbing down" of children by the rampant use of workbook type activities that limit vocabulary and critical thinking processes.

Another reason homeschoolers believe that teaching is deficient in schools is because often non-specialists teach. Homeschoolers claim that children get taught by non-specialists. Scharf (1989) supports this claim about the lack of specialists in schools. He found that in Saskatchewan twenty-eight percent of mathematics teachers in high school have no university mathematics courses and twenty-six percent of high school English teachers have only a freshman English course. Another source of less than optimal teaching is that there is a virtual 100% turnover of teachers every decade (Murphy, cited in King, Murphy, Watkinson, & Walker, 1989). This surely works against the maximum development of teaching competence.

When asked about their ability to teach academic subjects, many homeschoolers respond by saying that good parenting is the only qualification necessary for them to teach their children. To these homeschoolers "good parenting involves consistent responsiveness, warmth, and creating a happy home environment where each child is a valued and responsible member, depended upon and respected" (Common & MacMullen, 1986, pg.7). Moreover, they question the educational assumption that children learn as a result

of the teaching act. They trust in the child's capacity to learn without being directed or instructed. Just like children learn to talk, which is one of life's most difficult tasks, without formal instruction, so can they learn the myriad of desciplines and responsibilities in life without formal instruction. For example, "in families where adults read to children and read in front of children, leave all kinds of books around for children to look at, and answer their questions about reading, people learn to read with the same pleasure and confidence that accompanies their acquisition of speech" (Llewellyn, 1991, pg.36).

Proponents of homeschooling describe the advantages of homeschools. The children's developmental needs and interests are better met by homeschooling. They are taught in a tutorial style in which they are given much attention and ample time to complete projects. This intimate style of learning allows formal studies to be completed more quickly so that there is more time for pupils to pursue projects of interest to them. Further, McCurdy (1960), who conducted a study of twenty historical geniuses, claims that homeschooling setting is ideal for the creation of a genius. His work supports that an abundance of adult attention, isolation from peers, and the opportunity to engage for long periods of time in rich fantasy play are ingredients present in homeschooling. He argues that the public school system reduces all three of the above factors to minimal values,

and should, accordingly, tend to suppress the occurrence of genius.

On the topic of nuturing genius within individuals, traditional schools do not have a mandate for accomplishing such a goal. The objective of schooling is a basic education for the masses. Consequently, the unfoldment of the myriad types of genius within individuals must be sacrificed for the fundamental education of the group. As McCurdy claims, it is questionable whether genius can be fostered under such conditions. Furthermore, if mass education could enhance genius within individuals it would be limited to the arena of schooling-like skills. As a result, children who have the potential for genius in areas other than school-like activities would not have the opportunity to cultivate their talents to a level of excellence. At best, schools can aspire to manifest the brilliance of a select group of students who have a penchant for school-type tasks.

Regarding the claim that homeschools deprive children of important social experiences, advocates of homeschooling counter by emphasizing the many negative social problems found in schools. For example, they note the ill effects of excessive peer dependency. Bronfenbrenner concluded that continual peer involvement before the age of twelve brought about a "pervasive pessimism about oneself, one's future, parents, and even peers" (cited in King et al., 1989. p.

16). Furthermore, he discovered that peer-oriented children had doubtful habits, manners, and morals because they adopted the values of their peers rather than those of their parents. A still greater concern is the prevalent use of alcohol and other drugs in schools. Lischeron attributes this widespread use of alcohol to the pressures, competition, and irrelevance of much of the school experience (cited in King et al., 1989). Moore and Moore (1994), also, address the need for children to have more interaction with adults in order to encourage responsible behavior. They claim that there is too much competition with peers for status and success in schools. Also, children in schools are over powered with the expectations of peers equal in age and in developmental neediness. Supporters of homeschooling, therefore, contend the home is the ideal environment for the intellectual, social, and emotional development of the child. Furthermore, they feel that self worth in children is fostered by a stable value system at home rather than by peer contact.

This debate between homeschoolers and professional educators is best resolved by empirical evidence. Today, there is a growing body of empirical research on a number of the key issues about homeschooling. The next section of the literature review summarizes and critiques the current evidence on a central issue, the comparative academic achievement of homeschooled children.

A Review of the Current Research

It is only in the last decade that educational researchers have taken an interest in this subject (Stough, 1992 & Wright, 1988). The majority of the current work done on homeschooling has investigated characteristics of the homeschooling population and parents' motivations for educating their children at home (Gustavsen, 1981 cited in Wright, 1988; Stough, 1992; Ray, 1988; & Frost, 1988). Several comparison studies have been done with the homeschooling population which principally compare homeschooled children to public schooled children on the dependent variable of academic achievement. Also, three comparative studies have evaluated social and emotional adjustment of homeschooled children compared to public schooled children.

"Of all the homeschooling issues, undoubtedly the one receiving the most publicity centers on the academic achievement of homeschooled youth" (Calvery, 1992, p.1). This is readily understandably in that academic knowledge is the barometer most often used by educators to judge the quality of education that children receive. Consequently, academic achievement tests are the most common indicator in research on the caliber of education that homeschooled children receive. Ray (1986), who has extensively reviewed the outcome literature on homeschooling, reports eleven studies on the level of academic achievement of homeschooled

pupils. The majority of the studies first reviewed by Ray were completed prior to 1986. Since Ray's 1986 review, he and Wartes (1991) have updated the research done on homeschooling to include more current studies on academic achievement. Other studies that are included in this portion of the literature review are the most current work retrieved from a variety of educational data bases. Most of these studies are master's theses or doctoral dissertations that have investigated the academic achievement of homeschooled children. The next section of the literature review will present the majority of the outcome literature written on the academic achievement of home schooled students.

Outcome Studies on Academic Achievement

Although the following studies are not the most recent, they offer the most detailed and extensive examination of the academic achievement of home schooled children (Ray & Wartes, 1991). These studies were part of the Washington Homeschool Research Project in the State of Washington. The purpose of the project was to gather research on the achievement of home schoolers throughout Washington. Wartes completed four studies aimed at the aforementioned goal (1987, 1988a, 1988b, and 1989).

Washington state requires that all home schoolers take an annual achievement test. Wartes, therefore, had access to all test scores of home schoolers who took the yearly

achievement test. The instrument used to evaluate achievement was the Stanford Achievement Test Series (SAT). The home schoolers' scores were compared to the 1982 and 1986 state norms for the SAT.

The sample of home schoolers used in Wartes work were comprised of home schoolers who adhered to the state law. In 1986, the sample of 424 home schoolers who took the SAT had a median score in the 68th percentile. In 1987, the home schooling sample of 873 students scored in the 66th percentile. Their math computational scores were lower than the state norms. The home schoolers scored in the 42nd percentile in this area. However, their math application scores were "notably stronger" in the 65th percentile (Ray & Wartes, 1991, p.45). The median scores for the 1988 sample was at the 65th percentile. Wartes concluded that "fears that home-schooled children in Washington are at an academic disadvantage are not confirmed" (Ray and Wartes, 1991, p.45).

Wartes also investigated the relationship between academic achievement and several other variables with respect to his 1987 sample. He reported the following relationships. First, when he correlated parent education level to student achievement, he found that nine of the comparisons produced statistical significant correlations. However, fifteen of the correlations were not significant. Second, parent education level was not a strong predictor of

test scores. In fact, children whose parents had a 12th grade education scored above the national norm in achievement. Third, the data indicated that there was no relationship between level of structure or hours of formal schooling and academic outcomes. Fourth, there was no relationship between achievement and the number of consecutive years the student had been home schooled. Fifth, there was no relationship between academic outcomes and the grade level of the home school student within K to 9 range. Sixth, the data also suggested no relationship between income level and achievement. Finally, the data provided no evidence to support a relationship between the degree of religious content in the home education and achievement test scores.

The following studies are not as extensive as Wartes' work, but they offer related data on the achievement of home schooled students. Rakestraw (1987, 1988) compared SAT scores of six to twelve year olds. Her sample was comprised of 84 home schooled children from the state of Alabama. She hired trained research assistants to administer the test. Her findings revealed that no significant differences between the state norms and the home schooled children in the areas of reading, listening, and mathematics for grades 1, 4, and 5. She did find that the grade 2 home schooled children scored significantly higher than their public school peers in reading and listening.

Rakestraw tested two other hypotheses. She found no significant difference in achievement among home schooled children when grouped according to educational background of the parent-teacher. Secondly, she found no significant difference in the achievement of home schooled children in grade 1 and 2 when grouped according to whether the parent-teacher was or had been a certified teacher.

Maarse-Delahooke (1986) compared twenty-eight home educated children with thirty-two privately schooled children on the Wide Range Achievement Test Revised. She found the two groups did not differ significantly in their academic achievement. By matching the home educated children with the privately schooled children, Maarse-Delahooke attempted to control the influence of socioeconomic status on the outcome scores between the two groups. Maarse-Delahooke also matched the groups for I.Q. She used students who had above average I.Q. scores. Such steps help elevate the internal validity of this work.

Calvery (1992) designed an outcome study that used statistical procedures to analyze the difference in achievement between home schooled children and public schooled children. He analyzed the difference in mean scores on the MAT-6 of home schooled and public schooled children in grades four, seven, and ten in Arkansas. Calvery found that the "average Arkansas home schooled student showed signs of academic achievement better than the

average Arkansas public schooled student as measured by the six subscales of the MAT-6" (1992, p.4).

Similarly, Tipton (1992) found that generally, home schooled children equalled or exceeded public schooled children in most areas of academic achievement. He used the Comprehensive Test of Basic Skills (CTBS) to measure academic achievement and drew his sample of home schooled children from the West Virginia Christian Educators' Association. Certain trends were documented by Tipton (1992). He noticed that home schooled children seemed to perform well in reading areas, such as reading comprehension and vocabulary. Some of the home schooled children scored lower than the West Virginia Public School Norms in subjects that require memorization and considerable amounts of repetition such as spelling and certain categories of mathematics. Tipton commented that this lower performance "may reflect the disdain many home-schooling parents possess toward rote learning" (p 104).

Frost (1987, 1988) drew a sample of seventy-four home schooled children from a five-county area in northeastern Illinois. The students scores on the Iowa Tests of Basic Skills were compared to the national norms for all students taking the test and to norms of upper-socioeconomic students in public and private schools. Frost found that "home schooled children scored higher than the national norm in all subsections of the test and that the upper-socioeconomic

students scored significantly higher than their upper-socioeconomic public school counterparts" (Tipton, 1992, p.41).

Scogin (1986) conducted a random sample survey of 300 families from the membership list of the Home School Legal Defense Association. From a total of 591 students eligible for testing, 241 students were tested. Scogin found that in reading, 9% were below grade level, 18% were at grade level, and 73% were on year or more above grade level. In mathematics, 21% were below grade level, 29% were at grade level, and 50% were above grade level. No information was given on how these children were tested and who tested them.

The Hewitt Research Foundation (1986) found that home schooled children scored in the seventieth and eightieth percentile on achievement tests. There is no mention which tests were used to evaluate achievement, nor was it stated how these tests were administered.

Linden's 1983 study contended that home schooled children performed above average on the California Achievement Test. Support for Linden's conclusions was given by the presentation of grade levels. Although the home schooled children were reported to have performed above the norm group on grade levels, it is not evident whether these differences in performance were significant differences.

Gustaven (1981) described a survey he completed on 221 home school families. He concluded that the home school children rated above average on achievement tests. However, no attempt was made to introduce descriptive or statistical evidence to support his claim.

Studies on Cognitive Development

Some researchers took another approach in evaluating outcomes of home schooled children. The next group of researchers evaluated the cognitive outcomes of home education in terms of intellectual development rather than achievement test scores.

Perkel (1979) compared the cognitive development of Spanish speaking home schooled four year old children from low socioeconomic backgrounds with a group of randomly selected four year olds who were part of a local preschool program and four year olds who received no preschool training.

The findings of the study revealed that no significant cognitive differences were found between the home based and school based preschool children that received cognitive instruction. However, no information was given on how well the children without training scored on the achievement test, nor was any information given on the differences in cognitive development between the children who had preschool training versus the children who had no preschool training. Minimal confidence can be given to the researcher's

conclusion because no attempt was made to demonstrate how the data supported the conclusions stated in the study.

Tizard, Hughes, Pinkerton, and Carmichael (1982), (1983 a), and (1983 b) were also interested in the cognitive development of four year olds. In their 1982 study they compared adults' cognitive demands on girls at nursery school and at home. In their second study done in 1983 they studied children's questions. Special attention was given to the Children's use of "why" questions because they were used as indicators of the child's curiosity and because they provided occasions for adults to enlarge the child's cognitive understanding. In their last study, Tizard et al. (1983b) investigated the language use and language development of middle-class and working-class four year old children at home and at school. From the three studies the researchers found significant differences in cognitive development between four year olds taught at home and those taught at school. They found that "in their own milieu [home], working class children display all the essential verbal cognitive skills" (Tizard, Hughes, Carmichael, and Pinkerton, 1983, p.540; cited in Ray, 1986, p.27). Furthermore, Ray states that "despite the widespread belief in the benefits of nursery school, the evidence" of Tizard, Hughes, Carmichael, and Pinkerton reveals that these same working class children are "much more likely to receive this [measured attention to the child's language needs] from

their mother than from teachers" (Tizard, Hughes, Carmichael, & Pinkerton, 1983, p.541; cited in Ray, 1986, p.27). In fact this work demonstrated that children's intellectual and language needs are much more likely to be satisfied at home than at school at preschool ages.

Quine and Marek (1988) looked at cognitive outcomes in terms of intellectual development rather than achievement test scores. The researchers used performance on Piagetian tasks to compare eleven home schooled children (72-131 months) to nineteen peers (matched on age and gender) who were involved in the Pathways Alternative School. The school was specifically designed to develop Piagetian intellectual tasks. Using a pretest-posttest design, these researchers found that there were no significant differences between the two groups. Quine and Marek concluded that both groups were slightly ahead, in terms of intellectual development, "of the somewhat privileged population of Piaget's original investigation" (Ray & Wartes, 1991,p.49). They further found that the home educated students moved into formal thought between ages ten to eleven, which is earlier than the national average of fifteen to twenty years old.

Case Studies and Academic Achievement

Reynolds (1985) interviewed and tested five children who were given achievement tests. The average score was at the 86th percentile level. Some of the tests were done by

the school and some of the tests were administered by parents.

Schemmer (1985) also tested five children. Only two achieved at or above grade level for the Peabody Individual Achievement Test. Since only three of the five children could be tested for achievement, Schemmer concluded that the results were inconclusive.

Distance Education and Academic Achievement

In these last studies that examine academic achievement and home educated children, the state or government rather than taking an adversarial role in home education actually worked to support and sustain home education.

In Australia a study was done that compared conventionally schooled high school matriculation students to home schooled students who completed a correspondence program for high school matriculation. The Western Australia Department of Education (1978) claimed that the home schooled children performed satisfactorily on that region's achievement exam. Similar to Gustaven, no numerical evidence was provided by the researcher to endorse these claims. Ray (1986) points out in his review of this study that "the author simply made a qualitative statement about student performance on the achievement test" (p.28).

In 1985, the Washington State Superintendent of Public Instruction attempted to evaluate the success of an educational program that used parents as tutors under the

supervision of certified teachers. It was found that children K-8 who were parent tutored scored above the national average on the SAT. The sample consisted of one hundred children from a cross section of various communities across Washington State.

Alaska's Centralized Correspondence Study Program (CCS) complete K-12 program is delivered to students at home through the mail and operated by Alaska Department of Education (ADE). The ADE decided to evaluate the quality of their Correspondence Study Program (CCS). The CCS students were compared to conventional students on the California Achievement Tests in 1984, 1985, and 1986. In all cases, the home schooled CCS students were able to achieve as well as and often better than their Alaskan and national peers.

More specifically, the ADE examined the home schooled students from grades 1-8 in reading and math. The CAT reading scores for the CCS grades 1-3 were .58 to 1.31 standard deviations (SD) higher than the state norms. Grades 4-8 reading scores were .67 to 1.12 SD higher than the norm. Grades 1-8 math scores were .42 to 1.13 SD higher than the norm. In general, it was found that the CCS home schooled students scored significantly higher than the theoretical distribution.

The preceding studies represent the majority of the empirical outcomes studies on the academic achievement of home schooled youth. The available evidence indicates that

home schooled children generally score as well as or better than public schooled children on measures of academic achievement. However, there is no assurance that the home and conventional school groups were homogeneous in nature, nor is it certain that the home schooling samples used in these studies are representative of the home schooling population. Despite these methodological problems, it appears that the overall phenomenon is not inhibiting the youth who are taught at home from matching or excelling average conventional school achievement.

Limitations of the Current Research on the Academic Achievement of Home Schooled Children

Design

The use of the static-group comparison design, to determine the differences in achievement between home schooled and conventionally schooled children, poses a number of threats to the internal validity of the studies done in this area. There is no assurance that the treatment of home schooling has a direct relationship to the reported outcomes presented by the researchers in this field. The lack of adequate control of extraneous variables diminishes the validity of the findings asserted in the study. The static-group comparison design did not eliminate other variables that could have influenced the outcome scores of the participants in the study. Therefore, a number of other

competing explanations could account for the results that were reported.

One competing explanation that could have contributed to the similar mean scores between the home based education and traditionally based education is the possible inequality of the groups prior to the application of the treatment. Since neither randomization nor matching was used to assign subjects to the experimental and control groups, it cannot be assumed that the groups were equivalent prior to the experimental treatment. They may have differed on certain relevant variables and it may be these differences rather than the home based teaching environment or the home based teaching program (the treatment in these experiments) that were responsible for the findings. A difference in intelligence and not the difference in treatment between the control groups and the experimental groups could have been the reason why the home schooled children did as well as the traditionally schooled children. Differences in the socioeconomic status between the two groups could have also accounted for the positive outcomes of home schooled students.

Another possible explanation for similar post-test means between the home based and the classroom based education could be that the parent-teacher families who volunteered to be part of these experiments possessed some inherent characteristics that had a positive effect on the

treatment. Therefore, the inherent characteristics of these families and the treatment interacted in a way that resulted in comparable mean scores between the experimental groups and control groups. It would be the interaction, rather than the home schooling setting by itself, that produced the reported results. Perhaps the mothers' (mothers are most often the principle teachers of home schooled children) motivation or interest interacted with the treatment which resulted in good performances on the academic measurement instrument. Consequently, these results may only be transferable to home schooled children who have mothers with similar characteristics to the mothers in these experiments.

An additional explanation for the comparative outcome means between the home schooled and traditionally schooled children could be the interaction between the type of participants chosen for the study and the maturation rate of those participants. The experimental groups may have had a higher rate of maturation (highly variable rates of maturation are common with young children) than the control groups. Thus, it may have been the heightened rate of maturation in combination with the treatment and not the treatment singularly which was responsible for the comparable mean scores between the groups.

The inability of the researcher to eliminate the possible competing explanations for the observed results has compromised the internal validity of these studies. In this

work it is not clear that there is an intrinsic relationship between home based learning and the comparable outcome scores between the home schooled children and conventionally schooled children.

Some of the researchers in this field have tried to overcome the weakness of the static-group comparison design.

Wartes (1987, 1988a, 1988b, 1989) not only analyzed 100% of the testing scores collected by independent testing services through out Washington State, but he added rigor to his work by mailing out questionnaires to those parents who had their children tested. Consequently, relationships between achievement and several other variables were able to be analyzed. Variables such as parental education, hours of formal education, socioeconomic status, numbers of years home schooled, and religious content in instruction were evaluated to see whether there was a strong relationship to the home schooled children's achievement.

Rakestraw (1987, 1988) attempted to evaluate the effect of educational background of the parent-teacher. She found no significant relationship in achievement of home schooled children when grouped according to their parents' educational background.

Maarse-Delahooke (1986) sought to eliminate the variable of socioeconomic background by matching the home schooled sample with privately schooled children. She found no significant difference between these two groups. Similar

to Maarse-Delahooke (1986), Frost (1987, 1988) matched his home schooling sample to upper-socioeconomic students in the public and private schools. He found that the home schooled children out performed their upper-socioeconomic peers.

The Alaskan studies dispel the criticism that home schooled students perform well on achievement tests because they come from a more intelligent population. The ADE refuted this claim by comparing scores of grades 4 to 8 students after their involvement in CCS to their scores before the CCS study. The data revealed that these students did significantly better after CCS involvement than before CCS.

Through the use of reputable testing instruments, statistical analyses, and questionnaires, the preceding researchers have endeavored to eliminate some of the confounding variables that plague this work.

Sample

A leading problem prevalent in educational research is the difficulty of obtaining a representative home schooling sample.

The representativeness of home schooling families in contemporary investigations is weakened by the existence of many home schoolers who are not part of an organized group or who are not on a mailing list. Customarily, home schoolers who are registered with some type of governmental agency or support group or who are on mailing lists of

newsletters are most often solicited to participate in educational research projects. It is doubtful whether collectively these home schooling sources typify the home schooling population, since many home schooling families are reluctant to register with school boards, participate in research, or share addresses and phone numbers even with support groups because they fear harassment from local school officials. Moreover, these home schoolers operate outside the knowledge of the establishment in order to maintain their independence. They argue that the methods used by the mainstream to define "satisfactory instruction are too rigid or philosophically contradictory" to their vision of education (Common & Macmullen, 1985, p.5; Frost, 1988; Wright, 1989).

Even when researchers make an effort to invite an accessible group of home schoolers (like those who are part of a support group or who are registered with a school board) to participate in some sort of an inquiry on achievement, there is often a low response rate to these requests (Wright, 1989). Naturally, the reluctance of home schoolers to participate in testing programs makes it difficult to acquire a representative sample of this population. Hence, the limited generalizability of such work. Present research data should be generalized to home schooling families who participate in research projects, who

are on mailing lists, who are members of a support group, or who are registered with some type of governmental agency.

Sampling bias is also compounded in the present outcome research because home schooling samples consist of volunteers. If the home schooling families who volunteer in research are different from families who do not volunteer in research, then the samples obtained by the scientists will be biased. Perhaps home schoolers who participate in research studies feel successful in their home schooling choice, while those who do not participate in research studies feel less secure in their decision to home school. The volunteer nature of home schooling samples again limits the generalizability of the reported outcomes in home schooling studies. Results are further restricted to home schooling families who are similar to those home schooling participants who volunteer to be part of research programs.

One final difficulty with the samples selected for this kind of research is the size of these samples. They are often too small for any type of statistical analysis. Larger samples are more likely to be representative of the accessible population of home schooled children.

Instrumentation

Frequently the outcomes studies on home schooled children lack reports on the measures of the reliability and validity of the tests used to calibrate academic achievement (Ray, 1986 & Wright, 1989). Furthermore, the tests used to

determine academic achievement may not be appropriate for the home schooled population.

Describing reliability scores helps readers evaluate whether the instrument used in the experiment can obtain consistent results. The most common forms of reliability used in the evaluation of achievement tests are the split halves and the Kruder-Richardson (K-R20) reliability coefficients. Both these types of reliability are used to determine whether all the items of the test measure the same trait. A split half reliability score is subject to greater amounts of error because it is difficult to obtain two comparable halves of a test. So, this method of reliability systematically underestimates the reliability of the entire test (Ary et al., 1972).

The most common tests used to measure academic achievement in this field are the California Achievement Test (CAT), the Stanford Achievement Test (SAT), and the Comprehensive Test of Basic Skills (CTBS). The SAT has a spilt half reliability correlation of .90 which is a highly respectable reliability score. A reliability score of .80 to 1.00 indicates that the effect of random error on the consistency of the test is low. The CTBS and CAT use alternate forms reliability coefficients to ascertain reliability. In alternate form reliability the consistency of the test is evaluated by the correlation of results between parallel or alternate forms of the test. Alternate

form reliability is the most rigorous type of reliability. It is recommended for calibrating the reliability of achievement tests (Ary, Jacobs, & Razavieh, 1972).

Although a test may be reliable it may not accurately measure the construct it was developed to measure. It may be consistently measuring the wrong construct. A math achievement test may be consistently measuring reading comprehension and math and not solely math skills. Validity is concerned with the ability of the test to measure what it is purported to measure.

Content validity is most often used to validate achievement tests. Content validity demonstrates the extent to which the test samples both the topics and cognitive processes included in the content universe. One method that is used to obtain content validity is to have a number of experts systematically examine the content of the test and assess its relevancey to the construct under examination. Only three studies present validity information. Usually, the researcher stated that the test developer described the procedures used to construct the test. It appears that none of the achievement tests used in these studies were subject to the examination of expert judges.

Not only are more detailed explanations about the reliability and validity of the instruments needed, but the suitability of these instruments to evaluate achievement in home schooled children is questionable. It is doubtful that

achievement tests evaluate the majority of cognitive operations or the higher levels of cognitive ability. The CTBS, which is highly correlated to the CAT and a number of other reputable achievement tests, was found to only test nine of the possible twenty-two cognitive operations established by Jesse (1987; cited in Tipton, 1992) and none of the higher cognitive operations delineated by Bloom's Taxonomy (San Diego City Schools, 1984; cited in Tipton, 1992). It could be possible that home schooled children develop different cognitive abilities than those typical of conventionally schooled children. If achievement tests only evaluate school type tasks and ignore many other domains of cognitive ability, then the validity of using such tests on children who do not attend school is rather limited. Home schooled children may develop many valuable areas of cognition that are not represented on current achievement tests. Moreover, home schooled children may be further disadvantaged if they are being compared to children who are routinely trained in the content areas of achievement tests by teachers (Moore & Moore, 1994). Some effort should be made to rectify these inequities. It would be unacceptable to educators if tests that were designed to assess cognition in home schooled children were used to assess achievement in public schooled children. It might be more useful and fair to ascertain the goals and aspirations that home schooling families seek to achieve. Then instruments could be

developed to measure how well home schoolers accomplish the goals that they have developed for home schooling.

One final comment about instrumentation and outcome research on home schooling is the lack of standardized procedures. It is preferable if researchers used independent services to test home schoolers instead of relying on parent administered tests. It is also questionable whether comparing home schoolers to tests normed on the traditionally schooled population is a valid comparison, since many critics argue that the two populations are not equivalent.

Summary

Essentially, the pre-experimental design of this body of research, as well as the volunteer nature of the home schooling sample limits the internal validity of the experiments and the generalizability of the results. There is no assurance that the home schooled and the conventionally schooled students were homogeneous. It is also not certain that the home schooling sample in the majority of this work is representative of the home schooling population. However, it is quite evident that the overall phenomenon (meaning the interaction of the type of youth involved in home schooling and the home schooling treatment) is not inhibiting these students who participated in this study from matching or excelling conventional school achievement.

CHAPTER THREE

RESEARCH METHODOLOGY

Sample

A profile of the academic achievement of Albertan home schooled elementary students should be based on the test results of all home schooled children in grades 3 and 6 in English and Mathematics. However, the majority of home schooled children do not take the Provincial Achievement Testing Program. Furthermore, because of costs the Student Evaluation branch of the Alberta Department of Education was willing to supply only part of the achievement results of the home schooled children for 1996.

The sample of home schooled children consisted of all (212 grade three and 186 grade six) those who volunteered to write the Alberta Achievement Testing Program. The Student Evaluation branch of Alberta Education reports that approximately 30-40% of home educated students took the Alberta Provincial Examination.

Five random samples were drawn from the private and public school children in Alberta, all of whom are required by law to write the Alberta Provincial Testing Program in grades three and six. About 93% -95% of conventionally schooled children wrote the provincial exam in 1996. The five grade three samples consisted of 212 pupils in each of

the samples. The five grade six samples consisted of 186 pupils in each of the five samples.

The samples were randomly selected by the SPSS computer program. The SPSS program randomly samples the number of subjects or cases from a population that it is ordered to sample.

The decision to use five random samples in grade three and grade six was made in order to eliminate the chance of selecting a biased sample of exceptional conventionally schooled children who might display unusual achievement patterns (much lower or higher achievement than the average student). The homeschooling sample in grade three and grade six will be compared to all five random samples of conventionally schooled children in grades three and six. If the statistical analysis indicates that the homeschooling sample is significantly different from each one of the five random conventionally schooled samples, then it is more likely that a meaningful difference exists between the homeschooling sample and the conventionally schooled population.

Variables

The independent variable is the type of education chosen by the parents of school aged children in Alberta--home schooling or conventional schooling. The dependent variables are the Alberta Achievement Testing Program Scores

in the language arts--reading and writing for grades three and six.

Instrumentation

In 1996, the grade three and grade six tests in the reading and writing fields used raw scores. The maximum possible reading scores were 40 for grade three and 50 for grade six. The maximum possible writing scores were 35 for grade three and 105 for grade six. The reading and writing scores were weighted equally in calculating the total test score.

In grade three, the writing component consisted of one writing assignment given during a seventy minute time period. The reading component was administered during a sixty minute period and consisted of forty multiple-choice questions based on reading selections from fiction, non-fiction, poetry, and visual media. The grade six writing component consisted of two writing assignments designed to be completed in two hours. The reading multiple-choice test was designed to be completed in sixty minutes. The multiple-choice questions were based on reading selections from fiction, non-fiction, poetry, and visual media.

Alberta Student Evaluation does not provide any information in their test brochure on the reliability and validity of their achievement test. Upon perusal of the the testing booklets, it appears that the Alberta Provincial Testing Program is similar to other achievement testing

batteries (such as the CTBS, CAT, and SAT) that have been well documented in validity and reliability. One advantage of using the Alberta Achievement Testing Program, over other highly acclaimed achievement tests, is the fact that it is more representative of the Albertan norm group and curriculum.

Data Gathering

The student evaluation branch of Alberta Education organized the testing of the home schooled sample and the traditionally schooled population. All students were supervised by a certified teacher within a school setting. The tests were written in May of the 1995/1996 school year. The tests were marked by Student Evaluation.

Design

An **ex post facto** design was used to compare the differences in achievement between home educated and traditionally schooled children. A **ex post facto** or causal-comparative design aims at the discovery of possible causes of a dependent variable (such as academic achievement) by comparing the achievement of participants exposed to an independent variable (such as homeschooling) with the achievement of those not exposed to it. The **ex post facto** instead of the experimental method was used because the type of schooling a student receives does not lend itself to experimental manipulation.

Data Analysis

A multivariate analysis of variance (MANOVA) in conjuction with Bonferroni Post Hoc Tests was used to determine whether the home and conventionally schooled groups differ significantly in their achievement on the grade three and six language arts tests. The MANOVA and its Post Hoc Tests verified whether the differences between the samples are simply due to chance or whether there are systematic treatment effects that caused the scores in one group to be different from the scores in another. This type of analysis has been chosen in order to accommodate the different variables and treatment groups investigated in this study. The MANOVA was, therefore, able to drastically reduce the number of tests required to evaluate whether significant differences existed between the various treatment groups on the two variables of reading and writing.

In this study four MANOVAS were conducted. Two of them were preliminary MANOVAS and two were main MANOVAS. The main MANOVAS were used to compare the treatment group (homeschooling sample) to the control groups (conventionally schooled samples) for grades three and six.

The preliminary MANOVAS were used to verify whether the random samples drawn from the conventionally schooled population were equivalent to the entire conventionally schooled population. Once equivalency is determined, then it was no longer necessary to compare the experimental group

(homeschooling sample) to the entire conventionally schooled population, since any one of the samples drawn from the conventionally schooled population was analogous to that population.

Another reason for conducting preliminary MANOVAS for grade three and grade six was to reduce the possibility of finding a treatment effect when in reality the treatment had no effect or very little effect. If there is a treatment effect in a population, the size of a sample affects the probability of a statistical test to detect the treatment effect. Large samples better represent the population from which the sample is drawn. Consequently, the standard error (the difference between the population and the sample) in large samples is small, while the standard error in smaller samples is greater. When the standard error is small, as is the case with large samples, it is more probable that the sample means in the treatment distribution will fall beyond the critical region boundary, thus indicating that a treatment effect exists. On the other hand, when the sample size is small and the standard error is larger, a smaller proportion of the sample means in the treatment distribution will fall beyond the boundary of the critical region. Therefore, there is less chance of detecting a treatment effect; in other words, there is less power in smaller samples than in larger samples (Gravetter & Wallnau, 1992).

The statistical power would be extremely high in this experiment if the homeschooling sample were compared to the conventionally schooled population. The large size of the conventionally schooled population (40,287 grade six students and 38,966 grade three students) and the relatively small homeschooling sample (212 for grade three and 188 for grade six) would have made it more likely to detect a treatment effect or statistical significance even when small differences occur between the mean scores of the groups. Therefore, it was important to use equivalent sample sizes in order to reduce the chances of finding significance and thus committing type I error.

In sum, the preliminary MANOVAS was used to verify that the smaller samples of conventionally schooled children were equivalent to the entire conventionally schooled population. Such a measure greatly reduced the possibility of type I error. Secondly, once equivalency was estabished (between the conventionally schooled population and the conventionally schooled samples), the preliminary MANOVAS made it possible for the conventionally schooled samples (rather than the entire population) to be compared to the homeschooling sample. Thus, the detection of significance was a result of a real treatment effect and not because of size of the sample.

Thirdly, the main MANOVAS was used to verify whether significant differences existed between the homeschooling

samples and the randomly selected traditionally schooled samples. In total, four MANOVAS were conducted. Two of the MANOVAS were preliminary, one for grade three and one for grade six. The other two were main MANOVAS for grades three and six respectively.

Null Hypothesis

The following null hypothesis was formulated in order to answer the research questions concerning the difference in academic achievement between home schooled and conventionally schooled children.

There are no significant difference among the mean scores on the Alberta Provincial Achievement Testing Program in reading and writing between home schooled and conventionally schooled children in grade 3 and grade 6.

Limitations and Delimitations

As mentioned in chapter two, certain limitations are present in static-group comparison designs. The sample of home schooling families and their children most likely does not represent the total population of Alberta home schoolers. Although 632 grade three and 581 grade six homeschooled students were eligible to write the provincial achievement test in 1996, only 212 grade three and 186 grade six students wrote it. Therefore, the home schooling sample in this study represents only 35% of the home schooled population in grade three and 32% of the home schooled population in grade six for the year of 1996. Compounding

the problem of attaining a representative sample is the fact that some home schooling families are suspicious of governmental agencies and regulations. Consequently, some unknown number of home schoolers educate their children underground, which further limits the researcher's ability to describe and quantify this population.

Other problems with the design are the threats to the internal validity of the study. The static nature of the ex post facto design makes it difficult to eliminate other competing explanations for the possible difference in outcome scores between home schoolers and traditionally schooled children. Thus, extraneous variables such as intelligence, socioeconomic status, different rates of maturation of different groups, and mothers' motivation could also explain achievement differences found between the two groups. Although studies conducted in the United States have found no significant influence of the aforementioned extraneous variables upon the academic achievement of home schooled children (Ray & Wartes, 1986), this study did not attempt to determine their influence upon the achievement outcomes of the home schooled children that were sampled.

As cited in the literature review, there are problems inherent in the use of achievement tests to measure academic differences. Standardized achievement tests do not allow for recognition of higher cognitive abilities. Home schoolers may be more adept at higher cognitive abilities

than in the content driven domains of achievement tests. In addition, standardized test are intended to assess school-type tasks. Many other areas of genius which may be more valued by home schoolers (such as degree of independence, level of self-motivation, altruism, artistic ability, and mechanical giftedness) are not evaluated by these tests. Furthermore, the accuracy of the Alberta Provincial Achievement Testing Program scores may have been diminished by the home schooled children's inexperience in taking standardized achievement tests.

Finally, this study is limited to those home schooled and public schooled children who enrolled in grade three and six (or grade equivalents) and who studied reading and writing during the 1995-1996 school year. The study is not representative of other grades and other subjects areas.

Summary

This study seeks to compare achievement in provincial language arts test scores of home schooled and public schooled children in grades three and six. The results of the provincial achievement test comparisons are reported in the following chapter.

CHAPTER FOUR

RESULTS

The first part of this chapter will discuss the the data in a descriptive manner. Tables placed at the end of the chapter will be used to summarize the data presented in the text. The second part of the chapter will present the results from the statistical analysis. Summary tables that visually organize the statistical analyzes will be placed at the end of the chapter.

Explanation of the Descriptive Tables

Tables 1 summarizes and organizes some of the descriptive data for the grade three students. Table 2 presents some of the data for the grade six students.

Grade Three Descriptive Statistical Results

Table 1 demonstrates that homeschooling means for reading are higher (M = 31.13) than the six samples of regular schooled students. In table 1 sample 6 is the homeschooling sample, sample 7 is the entire conventionally schooled population, and samples 1 to 5 are the five randomly selected conventionally schooled samples. Means for regular samples 1 through 5 and the full regular sample 7 are 27.30, 28.92, 28.50, 28.89, 28.50, and 28.58. On average the homeschooled children scored three points more than the other groups on the reading test. In writing, the homeschooled students scored similarly (M = 21.30) to the conventionally schooled students (sample 1 M = 21.85, S2 M =

21.94, S3 M = 21.60, S4 M = 21.51, S5 M = 21.94, and S7--full sample M = 21.73).

The standard deviation results presented in table 1 indicate that the scores for the seven groups are generally near the mean (S1 SD = 5.43, S2 SD = 5.34, S3 SD = 4.93, S4 SD = 21.51, S5 SD = 21.94, S6--home school SD = 4.87, and S7 full sample SD = 5.17). On average the distance between each score and the mean is about four or five points for homeschoolers and traditionally schooled children, in writing. This might indicate that the homeschoolers and the conventionally schooled children come from relatively similar populations since their scores are comparably distributed.

In reading, the scores are a little more spread out (S1 SD = 8.60, S2 SD = 7.90, S3 SD = 7.52, S4 SD = 7.57, S5 SD = 7.57, S6--home school SD = 6.38 and S7 SD = 7.86). They range from six to eight points away from the mean. The homeschoolers' scores are slightly closer to the mean than the regular samples, in writing. The typical homeschooling student scored six points from the mean, while the typical conventionally schooled student scored seven and sometimes eight points away from the mean.

Table 1 also presents the means of the seven samples in percentages (S1 % = 68.25, S2 % = 72.31, S3 % = 71.25, S4 % = 72.23, S5 % = 71.25, S6--home school % = 77.83, and S7 % = 71.46). The typical homeschooler scored 6% higher than the

typical conventionally schooled child, in reading. However, the typical homeschooler scored 2% lower than the typical conventionally schooled student in writing (S1 % = 62.43, S2 % = 62.68, S3 % = 61.71, S4 % = 61.46, S5 % = 62.68, S6--home school % = 60.86, and S7 % = 62.09). The 2% difference between the home schooling group and the conventionally schooled groups was not significant in the statistical analysis.

Grade Six Descriptive Statistical Results

Table 2 presents the mean scores, the standard deviations, and the mean percentage scores of the homeschooled and conventionally schooled children in grade 6. The typical homeschooled student scored 37 out of 50 in reading, whereas the typical, traditionally schooled student scored approximately 35 out of 50 (S1 M = 35.12, S2 M = 34.57, S3 M = 35.13, S4 M = 34.84, S5 M = 33.98, S6--home school M = 37.26, and S7 M = 35.00). In writing, the average homeschooled and traditionally schooled child scored between 65 to 67 points out of 105 (S1 M = 67.61, S2 M = 64.44, S3 M = 67.35, S4 M = 65.66, S5 M = 64.91, S6--home school M = 65.28, S7 M = 66.75).

The standard deviations for reading and writing are more spread out in the grade six samples than in the grade three samples. However, the deviation scores are more similar among the grade six students than among the grade three students. The reading scores standard distance from

the mean are almost identical for the homeschooled students and the conventionally schooled students (S1 SD = 8.35, S2 SD = 8.42, S3 SD = 8.16, S4 SD = 8.81, S5 SD = 8.33, S6--home school SD = 8.36, and S7 SD = 8.37). In the writing portion of the achievement test, the typical distance between the homeschoolers' scores and the mean is sixteen points, while the typical distance between a conventionally schooled students' score and the mean is fifteen points (S1 SD = 15.19, S2 SD = 14.63, S3 SD = 15.17, S4 SD = 14.54, S5 SD = 15.68, S6--home school SD = 16.81, and S7 SD = 15.34). The larger standard deviation (sixteen point range) in the writing scores indicates that there are considerable differences in performance among the students, in writing. Consequently, it will be more difficult to draw inferences between the samples and the actual population that they represent.

Results from the Statistical Analysis

In the second part of this chapter the data analyzed in this study compared the reading and writing sections of the Alberta Achievement Testing Program scores of home educated and traditionally educated students in grades three and six.

Grade Three Results in Reading and Writing

A preliminary multivariate analysis of variance (MANOVA) was used to compare five random samples drawn from the conventionally schooled population and the home schooling sample to the entire conventionally schooled

population. The reason for comparing the random samples with the full population of conventionally schooled children in the MANOVA was to verify whether the random samples of the conventionally schooled children were equivalent to the entire conventionally schooled population.

The MANOVA indicated that a significant difference existed somewhere among the seven samples, $F(6, 40231) = 4.59$, $p<.01$. The **Scheffe's Post Hoc Test** was used in conjunction with the MANOVA to determine where significance existed. The **Scheffe Test** has the distinction of being one of the most conservative of all **post hoc** tests because it uses an extremely cautious method for reducing the risk of Type I error (Gravetter & Wallnau, 1991). Type I error is the error caused by chance that makes it seem that a treatment effect has occurred when there really is no treatment effect.

The **Scheffe's Post Hoc Test** compared the mean of the full conventionally schooled population or full regular sample to the means of the other samples: the home educated and the five random samples of conventionally schooled children. There were two significant **post hocs**. Sample 1 from the random conventionally schooled sample or the regular sample was significantly lower than full sample, $T(39176) = -2.37$, $p<.05$. The home educated sample was significantly higher than the full sample in reading, $T(39176) = 4.71$, $p<.01$. The other pairwise comparisons are

listed below. They indicate that no significant difference existed between the full sample and the remaining four regular samples in reading, sample 2 vs sample 7 $T(39176) = .62$, $p>.05$; sample 3 vs sample 7 $T(39176) = -.15$, $p>.05$; sample 4 vs sample 7 $T(39176) = .56$, $p>.05$; sample 5 vs sample 7 $T(39176) = -.15$, $p>.05$. Samples 1 to 5 represent the regular samples or random conventionally schooled samples. Sample 6 is the home educated sample and sample 7 is the entire conventionally schooled population or the full regular sample.

In writing, the post hoc tests indicated that there was no significant difference between the full sample and all five regular samples, sample 1 vs sample 7 $T(39176) = .32$, $p>.05$; sample 2 vs sample 7 $T(39176) = .57$, $p>.05$; sample 3 vs sample 7 $T(39176) = -.37$, $p>.05$; sample 4 vs sample 7 $T(39176) = -.62$, $p>.05$; sample 5 vs sample 7 $T = .57$, $p>.05$). Furthermore, there was no significant difference between the full sample and the home educated sample, $T = .22$, $p>.05$.

In sum, the post hoc tests indicated that there was no significant difference between the full regular sample and four of the regular samples, in reading. The post hocs also indicated that there were no significant differences between the full regular sample and all five of the regular samples, in writing. It can then be assumed that random samples 2 to 4 in reading and all the random samples in writing of

conventionally schooled children and the entire conventionally schooled populations are equivalent. Consequently, the home schooling data could be compared to random samples 2 to 4 in reading and all five of the random samples in writing of the traditionally schooled children. The summary tables of the preliminary MANOVA and the post hoc tests in reading and writing are presented in tables 3, 4, and 5 respectively.

The second MANOVA compared the five regular schooled samples (1-5) to the home school sample (6) on the dependent variables of reading and writing. The full regular sample (traditionally schooled population) was omitted because its large number (38,966) would have made it too easy to find significance. The second MANOVA revealed that significant differences existed between the groups, $F(5, 1266) = 5.21$, $p<.01$. The post hoc tests indicated that the home educated students performed significantly better than the five regular samples on the reading scale, sample 2 vs sample 6 $T(422) = -2.98$, $p<.01$; sample 3 vs sample 6 $T(422) = -3.55$, $p<.01$; sample 4 vs sample 6, $T(422) = -3.02$, $p<.01$; sample 5 vs sample 6 $T(422) = -3.55$, $p<.01$). The pairwise post hoc of sample 1 vs sample 6 was not included because the preliminary MANOVA indicated that sample 1 was significantly lower to the entire conventionally schooled population, which suggests that sample 1 is not equivalent to the greater traditionally schooled population.

In writing, the post hocs indicated that there were no significant differences between the home schooled and traditionally schooled children, sample 1 vs sample 6 $T(422) = .26$, $p>.05$; sample 2 vs sample 6 $T(422) = .19$, $p>.05$; sample 3 vs sample 6 $T(422) = .54$, $p>.05$; sample 4 vs sample 6 $T(422) = .67$, $p>.05$; sample 5 vs sample 6 $T(422) = .19$, $p>.05$. The summary tables of the main MANOVA for grade three and its post hoc tests in reading and writing are presented in tables 6, 7, and 8 respectively.

Grade Six Results in Reading and Writing

The same procedure of comparing the five random samples of regular schooled children and the sample of home educated children with the full regular schooled population was completed in the third MANOVA, which was the preliminary MANOVA for grade six. The preliminary MANOVA indicated that significance occurred, $F(6,41415) = 3.54$, $p<.01$. The post hoc test revealed that the significance only occurred between the full regular population and the home educated sample on the reading variable, sample 7 (the full regular sample) vs sample 6 (the home ed. sample) $T(40473) = 3.69$, $p<.01$. No significant difference was found between the full regular sample and the random samples of regular students in reading, sample 7 vs sample 1 $T(40473) = .84$, $p>.05$; sample 7 vs sample 2 $T(40473) = .48$, $p>.05$; sample 7 vs sample 3 $T(40473) = .83$, $p>.05$; sample 7 vs sample 4 $T(40473) = .78$, $p>.05$; sample 7 vs sample 5 $T(40473) = .09$, $p>.05$. Samples

1 to 5 are the five random samples of traditionally schooled children or regular samples. Sample 6 is the home educated sample and sample 7 is the entire conventionally schooled population or full regular sample. Since the regular samples are not significantly different from the full regular sample, this would suggest that these groups are equivalent in reading.

In writing, the post hocs found that there are no significant differences between the full regular sample, the regular samples, and the home educated sample, sample 7 vs sample 1 $T(40473) = .76$, $p>.05$; sample 7 vs sample 2 $T(40473) = -2.05$, $p>.05$; sample 7 vs sample 3 $T(40473) = .53$, $p>.05$; sample 7 vs sample 4 $T(40473) = -.96$, $p>.05$; sample 7 vs sample 5 $T(40473) = -1.63$, $p>.05$; sample 5 vs sample 6 $T(40473) = -1.30$, $p>.05$. This result would suggest that the five randomly selected conventionally schooled samples are equivalent to the full conventionally schooled population in reading and writing. It also suggests that there are no significant differences between the full regular sample and the home educated sample in writing. The summary tables of the preliminary MANOVA for grade six and its post hoc tests in reading and writing are presented in tables 9, 10, and 11 respectively.

When the fourth MANOVA or main MANOVA for grade six was used to compare the five regular random samples (1-5) and the home school sample (6), the results indicated a

significant difference somewhere among the groups, $F(5, 1122) = 3.33$, $p<.01$. Although the T values in the post hocs indicate significance for all the comparisons (sample 6 vs sample 1 $T(374) = -2.47$, $p<.05$; sample 6 vs sample 2 $T(274) = -3.09$, $p<.01$; sample 6 vs sample 3 $T(374) = -2.45$, $p<.05$; sample 6 vs sample 4 $T(374) = -2.79$, $p<.05$;.sample 5 vs sample 6 $T(374) = -3.77$, $p<.01$), the confidence levels span 0 in three of these pairwise comparisons (95% confidence level bands--samples 6 vs 1 = -4.58 to .29; samples 6 vs 3 = -4.57 to .30; samples 6 vs 4 = -4.86 to .01). When the upper and lower confidence level bands span 0, true statistical significance does not exist. This could be a result of the conservative approach taken to avoid Type 1 Error. In other words, the methods of data analysis have been overly cautious to ensure that claims of significance are not found when they may have been caused by chance. Such techniques can then increase the chances of committing type II error, which is the failure to find significance when significance does exist. Samples 2 and 6 are the only regular samples that do not span 0, thus indicating a significant difference between home educated and conventionally schooled children despite the cautious measures taken to avoid making false claims of significance (95% confidence level bands--samples 6 vs 2 = -5.12 to -.24; samples 6 vs 5 = -5.71 to -.83).

No significant difference was found in writing, between the home schooled children and the conventionally schooled children, samples 6 vs 1 $T(374) = 1.46$, $p>.05$; samples 6 vs 2 $T(374) = -.53$, $p>.05$; samples 6 vs 3 $T(374) = 1.30$, $p>.05$; samples 6 vs 4 $T(374) = .24$, $p>.05$; samples 6 vs 5 $T(374) = -.23$, $p>.05$. The summary tables of the main MANOVA for grade six and its post hoc tests in reading and writing are presented in tables 12, 13, and 14 respectively.

The F-ratio in all the MANOVAS was tested at an alpha level of .05. Significance was reported when the F values exceeded the critical cutoff values and when the lower and upper confidence levels did not span zero. If the F values were in the critical region, then such a result would have had a less than 5% probability of occurring by chance.

Summary

In summary, the achievement test means of home schooled children in grades three and six equalled those of traditionally schooled children, in writing. However, the home schooled students did significantly better than their traditionally schooled counterparts in reading.

Table 1

Descriptive Statistics for Grade Three

Sample	M-read	M-write	SD-read	SD-write	%-r	%-w
regular1	27.30	21.85	5.43	8.60	68.25	62.43
regular2	28.92	21.94	5.43	7.90	72.31	62.68
regular3	28.50	21.60	4.93	7.52	71.25	61.71
regular4	28.89	21.51	4.65	7.57	72.23	61.46
regular5	28.50	21.94	5.98	7.57	71.25	62.68
homesch6	31.13	21.30	4.87	6.38	77.83	60.86
reg. all	28.58	21.73	5.17	7.86	71.46	62.09

Note. M-read = mean in reading; W-write = mean in writing; SD-read = standard deviation in reading; SD-write = standard deviation in writing; %-r = mean percentage in reading; %-w = mean percentage in writing; regular 1 - 5 = random samples of traditionally schooled children; homesch6 = volunteer sample of home schooled children; reg.all = the entire traditionally schooled population.

Table 2

Descriptive Statistics for Grade Six

Sample	M-read	M-write	SD-read	SD-write	%-r	%-w
reg. 1	35.12	67.61	15.19	8.35	70.23	64.39
reg. 2	34.57	64.44	14.63	8.42	69.15	61.37
reg. 3	35.13	67.35	15.17	8.16	70.26	64.14
reg. 4	34.84	65.66	14.54	8.81	69.67	62.54
reg. 5	33.98	64.91	15.68	8.33	67.97	61.82
h.s. 6	37.26	65.28	16.81	8.36	74.52	62.17
regall	35.00	66.75	15.34	8.37	70.00	63.57

Note. M-read = mean in reading; M-write = mean in writing; SD-read = standard deviation in reading; SD-write = standard deviation in writing; %-r = mean percentage in reading; %-w = mean percentage in writing; reg. 1- 5 = the five random samples drawn from the traditionally schooled population; h.s 6 = the volunteer home schooled sample; regall = the entire conventionally schooled population.

Table 3

Preliminary MANOVA Comparing Mean Language Arts Perfomance Scores of Conventionally Schooled and Homeschooled Samples with the Conventionally Schooled Population for Grade Three in Alberta

Test Name	Value	Approx. F	Significance
Pillias	.00137	4.59271**	.000
Hotellings	.00187	4.59541**	.000
Wilks	.99863	4.59406**	.000

Note. The F Statistic for Wilks Lambda is exact. The MANOVA compared the means of seven samples (five randomly selected conventionally schooled samples, one homeschooling sample, and the entire conventionally schooled population) on the dependent variables of reading and writing.

*p<.05. **p<.01.

Table 4

Post Hocs of Preliminary MANOVA for Grade Three Reading Variable

Sample Parameter	t	Sig. t	95% Confidence Band Lower	Upper
1 vs 7	-2.37*	.01	-2.83	.26
2 vs 7	.62	.52	-1.20	1.88
3 vs 7	- .15	.87	-1.63	1.46
4 vs 7	.56	.57	-1.24	1.85
5 vs 7	- .15	.87	-1.63	1.46
6 vs 7	4.71**	.00	.99	4.09

Note. Results are significant when confidence bands do not span zero. Multivariate Bonferroni confidence intervals are reported. There are two significant post hocs. Sample 1 is significantly lower than the full sample and home ed. is significantly higher.

(a)1 = regular sample 1 (212 subjects)

(b)2 = regular sample 2 (212)

(c)3 = regular sample 3 (212)

(d)4 = regular sample 4 (212)

(e)5 = regular sample 5 (212)

(f)6 = home school sample 6 (212)

(table continues)

(g)7 = full conventional population (38,966)

*p<.05 **p<.01

Table 5

Post Hoc of Preliminary MANOVA for Grade Three Writing Variable

Sample Parameter	t	Sig. t	95% Confidence Band Lower	Upper
1 vs 7	.32	.74	- .90	1.13
2 vs 7	.57	.56	- .81	1.22
3 vs 7	.37	.70	-1.15	.88
4 vs 7	- .62	.53	-1.24	.79
5 vs 7	.52	.56	- .81	1.22
6 vs 7	-1.21	.22	-1.45	.58

Note. All the confidence bands span zero so there are no significant differences on this variable.

Table 6

Main MANOVA Comparing Mean Language Arts Scores of Conventionally Schooled Students with Homeschooled Students for Grade Three

Test Name	Value	Approx. F	Significance
Pillias	.03998	5.16522**	.000
Hotellings	.04158	5.25590**	.000
Wilks	.96005	5.21059**	.000
Roys	.03917		

*p<.05. **p<.01.

Table 7

Post Hocs of Main MANOVA for Grade Three Reading Variable

Sample Parameter	t	Sig. t	95% Confidence Band Lower	Upper
1 vs 6	-5.17**	.00	-5.91	-1.74
2 vs 6	-2.98**	.00	-4.28	- .12
3 vs 6	-3.55**	.00	-4.71	- .55
4 vs 6	-3.02**	.00	-4.32	- .15
5 vs 6	-3.55**	.00	-4.71	- .55

Note: The home school sample is significantly higher than the five regular samples.

**p<.01.

Table 8

Main MANOVA for Grade Three

Post Hoc for the Writing Variable

Sample Parameter	t	Sig t	95% Confidence Band Lower	Upper
1 vs 6	1.10	.26	- .84	1.93
2 vs 6	1.28	.19	- .75	2.02
3 vs 6	.60	.54	-1.09	1.68
4 vs 6	.41	.67	-1.18	1.59
5 vs 6	1.28	.19	- .75	2.02

Note. No significant difference here.

Table 9

Preliminary MANOVA Comparing Mean Language Arts Perfomance Scores of Conventionally Schooled and Homeschooled Samples with the Conventionally Schooled Population for Grade Six in Alberta.

Test Name	Value	Approx. F	Significance
Pillais	.00103	3.54517**	.000
Hotellings	.00103	3.54572**	.000
Wilks	.99897	3.54544**	.000

Note. The MANOVA compared the means of seven samples on the variables of reading and writing.

**$p < .01$.

Table 10

Post Hocs of Preliminary MANOVA for Grade Six Reading Variable

Sample Parameter	t	Sig. t	95% Confidence Band Lower	Upper
7 vs 1	.19	.84	-1.63	1.87
7 vs 2	- .69	.48	-2.17	1.32
7 vs 3	.21	.83	-1.62	1.88
7 vs 4	- .26	.78	-1.91	1.58
7 vs 5	-1.65	.09	-2.76	.73
7 vs 6	3.69**	.00	.50	4.01

Note. The regular samples are not significantly different from the full regular population. The only difference is with the home schooling sample. It would appear that the five regular samples are equivalent to the full regular population.

(a)1 = regular sample 1 (188 subjects)

(b)2 = regular sample 2 (188)

(c)3 = regular sample 3 (188)

(d)4 = regular sample 4 (188)

(e)5 = regular sample 5 (188)

(f)6 = home school sample 6 (188)

(table continues)

(g)7 = full conventional population (40, 287)

**p<.01.

Table 11

Post Hocs of Preliminary MANOVA for Grade Six Writing Variable

Sample Parameter	t	Sig. t	95% Confidence Band Lower	Upper
7 vs 1	.76	.44	-2.35	4.07
7 vs 2	-2.05	.03	-5.52	.90
7 vs 3	.53	.59	-2.61	3.81
7 vs 4	- .96	.33	-4.29	2.13
7 vs 5	-1.63	.10	-5.05	1.37
7 vs 6	-1.30	.19	-4.68	1.74

Note. No significant differences exist in these pairwise comparisons. All the confidence bands span zero.

Table 12

Main MANOVA Comparing Mean Language Arts Scores of Conventionally Schooled Students with Homeschooled Students for Grade Six

Test Name	Value	Approx. F	Significance
Pillais	.02923	3.32806**	.000
Hotellings	.02984	3.34170**	.000
Wilks	.97090	3.33489**	.000

Note. In this Multivariate Analysis the full regular sample is not included. The significance indicates that a treatment effect has been detected by this test.

**p<.01.

Table 13

Post Hocs of the Main MANOVA for Grade Six Reading Variable

Sample Parameter	*t*	Sig. *t*	95% Confidence Band Lower	Upper
6 vs 1	-2.47	.01*	-4.58	.29
6 vs 2	-3.09	.00**	-5.12	-.24
6 vs 3	-2.45	.01*	-4.57	.30
6 vs 4	-2.79	.00*	-4.86	.01
6 vs 5	-3.77	.00**	-5.71	-.83

Note. Though the *t* values look significant, the home schooling sample (6) is significantly higher than only two of the regular samples (2 and 5). The confidence bands of the other samples (1, 3, and 4) span zero.

*$p<.05$. **$p<.01$.

Table 14

Post Hoc Test of Main MANOVA for Grade Six Writing Variable

Sample Parameter	t	Sig. t	95% Confidence Band Lower	Upper
6 vs 1	1.46	.14	-2.12	6.77
6 vs 2	-.53	.59	-5.29	3.61
6 vs 3	1.30	.19	-2.39	6.51
6 vs 4	.24	.80	-4.07	4.83
6 vs 5	-.23	.81	-4.82	4.08

Note. No significance here. All the confidence bands span zero.

CHAPTER FIVE

DISCUSSION

The objectives of this chapter are to evaluate and interpret the implications of the results for the validity of the hypothesis presented in the introduction. To achieve the aforementioned objectives the following topics will be discussed:

1. Implications of the Results
2. Recommendations

Implications of the Results

In order to demonstrate how this study has helped resolve the original research problem and contributed to the development of theory, this part of the paper will: (a) present evidence of whether the data confirms the hypothesis, (b) compare the findings of this to other similar studies, (c) briefly summarize the shortcomings of the work, and (d) establish the theoretical consequences of the results.

The results appear to indicate that this subgroup of homeschooled children are performing as well as and sometimes better than conventionally schooled children in language arts. In other words, homeschooling families seem to be providing an environment which facilitates academic achievement in writing composition and reading that is comparable to that of children in conventional schools. More specifically, the results demonstrate that while

homeschooled and conventionally schooled children have comparable scores in writing composition, homeschooled children perform significantly better than conventionally schooled children in reading. However, the statistical significance in reading means may not translate to any type of meaningful difference between the two groups. The fact that on average there is only a two point difference between the reading means of homeschoolers and conventionally schooled children makes is questionable whether significant statistical difference depicts meaningful difference in reading performance. A Chi Square was conducted in order to settle the argument about meaningful difference in reading performance between homeschooled and traditionally schooled students. The results indicated that a significant difference exists in the distribution of scores between homeschooled and traditionally schooled children. In grade three, the home schooled sample had a significantly higher number of students scoring in the excellence range (X^2 (5, N = 1272) = 22.36, $p<.05$). Although the homeschooled sample had a higher percentage of students who scored in the excellence range in grade six, the statistical test indicated that the difference between the homeschooled and traditionally schooled students was not significant (X^2 (5, N = 1128) = 13.24, $p>.05$). It should be noted that nonparametric tests like the Chi are more likely to fail in detecting a real difference between treatments than

parametric tests (like MANOVAS). A computer printout of the Chi square is located in the appendix of this paper.

The higher reading scores of the homeschooled children may reflect homeschooling parents' emphasis on reading to their children. It may also demonstrate that the homeschooling environment fosters higher reading achievement. For example, homeschools have low student/teacher ratios which might enhance reading skills. Furthermore, students may tend to read better in home schools where learning tends to be more individualized, flexible, and embedded in a context of great meaning. On the other hand, the higher reading results of homeschoolers in this study could just be a reflection of a selection bias of highly motivated parents who are truly interested in their children's education. Perhaps examining other studies may help us to decide if the results are reliable and meaningful.

The findings of this study confirm the results that the majority of outcome studies on homeschooling report. Most studies on academic achievement of homeshcooled children cast a favorable light on home educated students. In fact, the preponderance of outcome studies done on the academic achievement of homeschooled children (which includes reading and writing ability) claim that homeschooled children score significantly higher than conventionally schooled children (Alaska's Correspondence Study, 1984, 1985, 1986; Calvery,

1992; Frost, 1987, 1988; Gustaven, 1981; Linden, 1983; Rakestraw, 1987, 1988; Wartes, 1987, 1988; Washington State Department, 1985). Some outcome studies claim that there is no significant difference in academic achievement between homeschooled and conventionally schooled children (Maarse-Delahooke, 1986; Tipton, 1992; The Western Australia State Department, 1978). Only a few studies show that homeschooled children have lower mean scores, but those are in very specific areas not in entire subject domains. Rather they are in skills requiring substantial amounts of repetition and memorization such as in spelling and some computational math activities (Frost, 1987; Tipton, 1990). This trend of lower achievement in skills that are heavily memory dependent is often explained in the literature by the observation that many homeschooling parents emphasize learning that is experiential such as visiting places, experimenting, and problem solving (Tipton, 1990).

While the findings of this study are congruent with that of others that claim that homeschooling children have similar or better outcomes, some attention needs to be drawn to the problems with the research in this domain. First of all, the inability of **ex post facto** research to control extraneous variables makes it impossible to isolate whether homeschooling is what accounts for the higher means on achievement tests. Factors such as the type of parents who choose to homeschool and socioeconomic status could have

contributed to the better performance of homeschooled youth rather than the act of homeschooling. These homeschooled children may have performed just as well or even better in conventional schools.

Secondly, studies done on homeschooling include self-selected samples. Consequently, the general cautions outlined in the literature review about using self-selected samples are appropriate. For example, the reason homeschoolers do well on achievement tests may be because they come from a different population than the average student that attends a conventional school. The families that homeschool and take achievement tests may be families that feel successful about their homeschooling experience. They may also be families that have a positive influence on their children's academic achievement because they are keenly interested in and supportive of their children's education. Children from the public school system with highly motivated parents could do just as well or even better on achievements tests as homeschooled children.

Despite the limitations of this research project however, the results support the current body of work that suggests that homeschooled children are receiving a comparable education to that of conventionally schooled children. Consequently, outcome scores of homeschooled children cannot be easily faulted when compared to those of traditionally schooled children (Ray & Wartes, 1986).

Recommendations

Research on the academic achievement of homeschooled children needs to be improved in several ways. First, the researchers who continue to study the efficacy of homeschooling need to find ways of controlling the confounding variables which are present in outcome studies. One way of improving the design of these studies is to use a matched-subjects design. The matched-subjects design attempts to make the groups within the study equivalent at the start, so that any differences observed can be attributed to the treatment.

Second, better ways of gaining access to homeschooling families need to be explored. For example, researchers may need to develop personal contact with homeschooling families in order to gain their trust and involvement in research projects. The offer of free educational dollars for homeschoolers' participation in evaluative studies might encourage more homeschoolers to take part in outcome research. This in turn will ensure more representative homeschool samples.

Third, longitudinal studies that assess the changes over time and examine the consequences of homeschooling are also needed. Most research on homeschooling investigates homeschooling at a particular point in time. More information about the competency of homeschooling in

academic achievement could be obtained if the long term consequences of the movement were investigated.

In general, a broader focus for evaluation is necessary in order to determine the successfulness of homeschooling. More cross-sectional and longitudinal studies which examine the social, emotional, and intellectual development of homeschooled children are required.

The feasibility of measuring academic achievement of homeschooled children is important to the majority of professional educators and educational researchers. However, considering the historical background of homeschoolers presented in the introduction, this goal of academic achievement might be secondary to those homeschooling families who choose homeschooling because of their commitment to child-centered learning. The issue of evaluation of academic achievement in homeschooling is further complicated by the recent influx of religious homeschoolers. Findings from research projects that investigate the demographics of homeschooling indicate the majority of homeschooling families were motivated by a "desire to instill religious beliefs and values in their children" (p. 81, McGraw et al., 1993).

Based on the preceding research findings, the research community's testing of the academic achievement of students may be irrelevant if academic achievement is not what is important to homeschoolers. We may need to find out what

the goals of home education are for homeschooling families. Researchers could then devise methods to determine whether home education is actually effective in meeting the goals of homeschoolers. Other areas besides academic achievement, such as creativity, altruism, moral development, motivation, self-learning, independence, critical thinking, and problem solving, may need to be investigated in order to determine the efficacy of homeschooling.

In the preceding discussion, the results were interpreted in terms of the hypothesis presented earlier in the study. The results were also compared to the body of work already completed by researchers in the field. The major shortcomings of the study were briefly described. Finally, future recommendations were delineated.

To sum up, despite the problems plaguing this type of study, the research has shown that the homeschool setting is a viable alternative for achieving traditional school-related academic goals such as writing composition and reading. The burden of proof now rests with those who wish to disparage the academic outcomes of homeschooling.

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Appendix A

Chi Square of Homeschooled and Traditionally Schooled Distribution of Scores on the Grade Three and Six Achievement Tests in Reading

Table A1

Chi Square Comparing the Homeschooling Distribution of Scores with Traditionally Schooled Distribution of Scores in Grade Three

	Sample					
	1	2	3	4	5	6
% Below	18.9	15.1	13.7	13.2	15.6	8.0
% Acceptable	54.2	48.1	55.2	50.5	51.4	47.6
% Excellence	26.9	36.8	31.1	36.3	33.0	44.3

Test Statistic

Chi-Square	Value	DF	Significance
Pearson	22.36**	10	.01
Likelihood	22.93**	10	.01
Linear-by-Linear Association	12.27**	1	.01

(table continues)

Note. The Chi Square compared the distribution of scores between the five random samples of traditionally schooled children and the homeschooling sample. Columns 1, 2, 3, 4, and 5 represent the five random samples of traditionally schooled children. Column 6 represents the homeschooled sample. The statistical test indicated that this particular homeschooled sample had a significantly higher percentage of scores in the excellence range than the five traditionally schooled samples.

*$p<.05$ **$p<.01$

Table A2

Chi Square Comparing the Homeschooling Distribution of Scores with Traditionally Schooled Distribution of Scores in Grade Six

	Sample					
	1	2	3	4	5	6
% Below	17.6	22.9	19.7	21.3	22.9	14.4
% Acceptable	73.9	65.4	66.0	64.4	67.6	70.2
% Excellence	8.5	11.7	14.4	14.4	9.6	15.4

Test Statistic

Chi Square	Value	DF	Significance
Pearson	13.24	10	.21
Likelihood	13.63	10	.19
Linear-by-Linear Association	1.54	1	.21

Note. Columns 1, 2, 3, 4, and 5 represent the five random samples of traditionally schooled children. Column 6 represents the homeschooled sample. Although the homeschooling sample had a lower percentage of scores in the

(table continues)

below average range and a higher percentage of scores in the excellence range, the Chi Square indicated that these differences were not significant. However, nonparametric tests are more likely to fail in detecting a real difference between treatments.